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## NOTES DE LA REDACTION

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Volume VII

March 1956

Number 1

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## CONTENTS

Page

Fatality Following Abdominal Arteriography . . . . .	<i>H. R. Roby, J. W. McKay</i>	1
Thrombosis of Internal Carotid Artery . . . . .	<i>B. J. Shapiro, E. S. Simor</i>	5
Roentgen Findings in Genital Tuberculosis in Women . . . . .	<i>Germaine Ratelle, Jean-Louis Léger</i>	9
Association Notes:		
Meetings . . . . .		4
Positions Available . . . . .		8

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# THE JOURNAL OF THE CANADIAN ASSOCIATION OF RADIOLOGISTS

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## FATALITY FOLLOWING ABDOMINAL ARTERIOGRAPHY

H. R. ROBY, M.D., C.M.,

and

J. W. McKAY, M.D., C.M., F.R.C.P.(C).

Montreal, Quebec

Since fatalities and even complications following translumbar aortography or arteriography have been rare or unreported since the introduction of the organic contrast materials and continued improvement in techniques, it was thought the following case deserved to be reported.

### Case Report

W.Y., a 73 year-old Chinese male was admitted to the Montreal General Hospital on January 6th 1955, for the investigation and treatment of a chronic ulcer above the lateral malleolus of the left leg that had been present intermittently for 10 to 12 years. He gave a history of pain in the left leg, but this was not necessarily related to walking. Prior to admission he had been treated in the Out-Patient Department of The Montreal General Hospital with an Unna's Paste boot and on admission the ulcer was about  $\frac{3}{4}$  of an inch in diameter.

Functional Inquiry revealed a chronic productive cough. Treated for a bloody discharge per urethra about 20 years ago. Apparently the blood Wassermann was positive at that time. Negative on this admission.

Physical Examination revealed an elderly well nourished Chinaman. The heart was slightly enlarged to examination, with a systolic murmur at the apex. The B.P. was 180/90. The throat was slightly injected.

Examination of the extremities: The left leg was grossly discolored almost to the knee and there were trophic changes in the skin, and an ulcer above the lateral malleolus. The clinical impression at this time was arteriosclerosis obliterans with an ulcer of the left leg, varicose veins and prostatism.

On January 11th 1955, translumbar arteriography was carried out with the injection of 50 cc. of 70% Urokon, under general anaesthesia.

On January 12th, the patient's temperature, which had been normal up to this time went up to 101° F. Later in the day he developed crampy abdominal pains and in the evening passed bright red blood per rectum on several occasions. On examination at this time his B.P. was 75/40 and the pulse 84. The abdomen was rounded and tympanitic. Rectal examination revealed a movable polyp. An anoscope was passed and the polyp was not seen, but the mucosa was described as granulation tissue that bleeds easily but no gross bleeding was present.

On the following day a flat film of the abdomen showed distension of loops of small bowel with fluid levels, suggestive of a bowel obstruction. An intestinal obstruction probably due to a "post-aortogram ileus" was the clinical impression at this time. A Cantor tube was passed and coffee ground material was suctioned from the stomach. Bowel sounds were absent until January 17th. On the 18th of January, he had violent faecal incontinence with passage of foul black stools. The x-ray picture continued to show evidence of ileus. The W.B.C. count at this time was 19,000 and Haemoglobin 80%.

Clinical note on January 24th states that the bowels have been moving for almost a week and the patient is still distended and there has been some pain on the left side of the abdomen. The patient was being maintained on intravenous fluids and the electrolyte balance maintained.

On January 29th protoscopic examination showed a sharp line of demarcation at the level of 10 cm. between normal mucosa below and green sloughing bowel mucosa above this to the level of about 20 cm and no obstruction was seen. Bleeding was seen from the normal mucosa. The proctoscope was again passed on January 30th and biopsies taken of the gangrenous mucosa. An ulcerating lesion was present on the posterior wall of the rectum.

On February 1st, 1955, a laparotomy was carried out under general anaesthesia and the small bowel was found adherent to the pelvis walling off a pelvic abscess that centered around a gangrenous sigmoid. The small bowel was also adherent along the left gutter. The site of transition from gangrenous to viable bowel was not seen though the transverse colon looked viable. An ileostomy was performed and large drains left in the pelvis.

On February 9th the ileostomy started to function and the electrolyte balance was almost impossible to control. His condition continued to deteriorate with the complication of epididymo-orchitis and fever of 101° F.

The patient died on February 22nd.

### X-Ray Findings

January 11th 1955 (Fig. 1) Aortogram: 70% Urokon was injected into the aorta at the level of L3. The films show a heavy concentration of dye in the lower aorta and in both common iliacs. A much decreased concentration of dye is seen in the left external iliac. The internal iliac is not visualized. This indicates a partial obstruction at the level of the bifurcation of the common iliac on the left. On the right side the external iliac is not visualized but the internal iliac with the superior gluteal is faintly seen.

A subsequent film taken of the lower thighs and upper portions of the legs shows small collateral vessels on both sides. The femoral is visualized on the left side, but not on the right.



Flat films of the abdomen on January 13th, 14th and 15th show dilated loops of bowel with fluid levels and being consistent with a diagnosis of paralytic ileus.

Barium enema on January 15th did not show any obstruction and there was a good reflux into the terminal ileum. The psoas shadows were well seen and it was suggested that this finding would tend to rule out the possibility of a retroperitoneal haemorrhage.

Flat films of the abdomen on January 18th, 27th, 28th and 29th still showed evidence of intestinal obstruction. Films of February 12th showed less distension of loops of small bowel and there was gas in the large bowel.

February 14th a small amount of barium given by mouth remained mostly in the stomach at five hours, although a fraction was seen in the small bowel.

A re-examination with barium on February 16th showed the barium to be emptying from the stomach and reaching the ileostomy at five hours.

### Post-Mortem Examination

For the sake of brevity the description of many of the organs will be omitted when the findings are essentially within normal limits.

**Abdomen:** Upon opening the abdomen, there was seen a diffuse peritoneal reaction with fibrous adhesions between loops of small bowel. A creamy green liquid was present over the loops of small bowel. The loops of bowel were adherent in such a manner as to close off the region of the true and false pelvis and when these adhesions were freed, one opened into a cavity lined by dark haemorrhagic granulating tissue and containing a length of completely necrotic material about 25 cm. in length which was presumed to be necrotic bowel and which was lying entirely free in this cavity. The left colon ended abruptly about 7 to 8 cm beyond the splenic flexure and opened into the gutter or cavity described above. The cavity passed down toward the pelvis and communicated directly with the outside via the anus.

**Aorta:** The aorta showed a marked atherosclerosis with ulceration and calcification throughout its entire length from aortic valve ring to beyond its bifurcation. Wrinkled areas interspersed with atheromatous plaques extended throughout the length of the aorta, into the great vessels of the arch and into the branches of the abdominal aorta. Just beyond the origin of the renal arteries the wall of the aorta was thickened by reddish coloured and roughened material similar to thrombus. In the anterior wall, just proximal to the bi-



furcation there was a marked thickening producing an egg-shaped lesion exteriorly. On section this lesion appeared to be within the wall of the aorta and appeared as a pale greenish yellow gel. This lesion extended up to and just beyond the origin of the inferior mesenteric artery. The latter artery coursed over this bulge on the external surface and was flattened by it. The ostium of the inferior mesenteric artery was found with difficulty and if not occluded by the aforementioned lesion, was nearly so.

The right common iliac artery showed aneurysmal dilatation and the wall was atheromatous but the lumen was not occluded. The right external iliac was occluded by thrombi. The right internal iliac was narrowed but not completely occluded. The left common iliac artery showed a fusiform enlargement but smaller than on the right and there was marked atherosclerosis and thrombus formation. The left internal iliac was completely occluded at the ostium. The external iliac artery was patent, although atheromatous.

Associated with the above changes, there was a bilateral suppurative epididymo-orchitis and an oesophagitis with terminal distal digestive erosion and rupture into a walled-off pleural pocket. Thrombotic occlusion of the right coronary artery was noted.

#### Discussion:

Although it is just over a quarter of a century since translumbar arteriography was first introduced by the Portuguese Urologist, dos Santos, it was not until relatively recently that the procedure has been widely used. The greatest obstacles to the general acceptance of aortography were the fear of puncturing the aorta, and the lack of a safe contrast medium. Experimental work on dogs had shown that aortic puncture did occasionally lead to marked haemorrhage, but this tendency to haemorrhage has not been found in humans. Cases that have come to autopsy following translumbar arteriography have not shown appreciable amounts of blood extravasated in the tissue adjacent to where the puncture was made<sup>2,3,4</sup>.

That the early investigators were aware of the hazards of aortography is apparent, as mention is made of renal damage and of a "dangerous zone" of injection which may be avoided if the contrast material is injected at the level of T12. Also various methods were devised to try to overcome these obstacles. Castellanos and Pereiras<sup>5</sup>, were the origina-

tors of retrograde or counter current arteriography in the late thirties. Farinas in 1939<sup>6</sup>, described a method whereby a catheter is passed through a trocar in the femoral, through the iliac artery and up to any desired level in the aorta. Other methods have been described; one a retrograde method using the radial artery, the other a complicated and involved procedure whereby the aorta is punctured through the oesophageal wall via an oesophagoscope.

At the present time most operators use the translumbar technique of dos Santos with modifications<sup>7,8</sup>. Many use a test injection of 5-10 cc. of the contrast material after the aorta has been punctured. Films are made of this test injection and are viewed to check the position of the needle in the aorta. The test injection also serves as a sensitivity test to the contrast material as many writers believe that the cutaneous test or the placing of small quantities in the conjunctival sac are of no value at all<sup>9</sup>.

Most of the deaths and serious complications following translumbar arteriography have been due either to the type of contrast medium or to the injection of the entire amount of the material into one of the branches of the aorta with resultant irritation and spasm of the vessel. Sodium Iodide caused a few deaths<sup>10,11</sup>. More deaths have occurred in angiocardiology and it has been suggested that this difference is due to the contrast material being more readily accessible to the kidneys when injected into the aorta.

The organic iodine compounds are universally used as contrast media at present and the danger of injecting the superior mesenteric artery with the full amount of material is considerably lessened although renal complications have been reported due to injection of the full amount of the contrast material into the renal artery or due to drug sensitivity<sup>12</sup>.

The patient in this case report may have developed mesenteric thrombosis without the insult of puncture and injection of the solution as there were well advanced atherosclerotic changes and the patency of the lumen of the inferior mesenteric artery was apparently already compromised to some extent. However, "it is a well known fact that trauma to an artery as the result of puncture by the needle and the force of injection by arterial distension may in themselves provoke reflex vasoconstriction"<sup>10,13</sup>. It is the belief of the writers that such a mechanism was in effect in the present case and caused a diffuse thrombosis of the inferior mesenteric artery.

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### THE CANADIAN ASSOCIATION OF RADIOLOGISTS SPECIAL GENERAL MEETING, JUNE 14, 1956

The Special General Meeting of the Canadian Association of Radiologists will take place as follows:

Tuesday, June 14, 1956	Time	Place
Meeting of Council	9:00 A.M.	Chateau Frontenac, Private Dining Room No. 2
Meeting of Council	2:00 P.M.	Chateau Frontenac, Private Dining Room No. 2
Special General Meeting	7:00 P.M.	Chateau Frontenac, Private Dining Room No. 1 (Dinner tickets to be purchased.)

### 8th International Congress of Radiology July 22nd to 28th, 1956, Mexico City

Anyone interested in receiving another copy of the Preliminary Programme should write to the Congress office, Calle de Oro No. 15, Mexico 7, D.F., Mexico, stating whether he would prefer the English, Spanish, French or German version.

Potential members are requested to enrol as soon as possible so that their applications may be dealt with promptly.

Applications for *Hotel Reservations* should be sent to the Congress travel agency, Wagons-Lits/Cook, Ave. Juarez No. 88, Mexico 1, D.F., as soon as possible as accommodation will be limited and priority will be given to those who enrol early.

### Second International Congress on Medical Radiophotography

The Second International Congress on Medical Radiophotography will take place in Paris, April 4 - 7, 1956. This Congress is being organized jointly by the International Union against Tuberculosis and the French National Committee for the Prevention of Tuberculosis.

# THROMBOSIS OF INTERNAL CAROTID ARTERY\*

B. J. SHAPIRO, M.D. and E. S. SIMOR, M.D.  
Toronto, Ontario

In 1937 Moniz published four cases of spontaneous thrombosis of the internal carotid artery as demonstrated by cerebral angiography. By 1951 Johnson and Walker<sup>1</sup> in a review of 33 papers assembled 101 cases and added 6 cases of their own. All these were demonstrated by angiography. Since that time a number of papers have been published and many more cases have been added to the literature.

Interest in this subject in Canada has been stimulated by clinical pathological studies carried out by Fisher<sup>2</sup> who reported 29 cases found at necropsy. Out of 175 unselected autopsies this author reported an incidence of 12.6% of carotid disease. He then presented the correlation between post mortem and clinical ante mortem findings.

Almost all of our cases were recognized during routine angiography to rule out tumor or aneurysm. We are presenting 12 cases, 9 of which were demonstrated by angiography and 3 were found incidentally at autopsy. These cases were seen between January 1953 and November 1954. Eight cases are from Westminster Hospital and four cases from Victoria Hospital, London, Ontario.

The angiographic diagnosis of this condition often helps to rule out other possibilities such as aneurysm, brain tumour, etc. In order to diagnose internal carotid artery thrombosis one must clearly demonstrate the site of the obstruction. A mere lack of filling of the internal carotid may indicate percutaneous puncture of the external carotid artery.

Since most of our cases were unsuspected we adopted the routine of securing A.P. and lateral angiograms, thus visualizing only the external carotid circulation over the skull and face. In addition, as is apparent from the reproductions, the patient was positioned so that an angiogram of the cervical portion of the common carotid and region of its bifurcation could be clearly shown. In this way the site of obstruction was demonstrated in all cases.

Figure 1 shows the anastomosis between the external and internal carotid circulation<sup>3</sup>. The external carotid artery lies anterior and medial to the internal carotid at the bifurcation. The external carotid artery supplies the thy-

roid, tongue, maxillary area and terminates in the internal maxillary and superficial temporal branches.

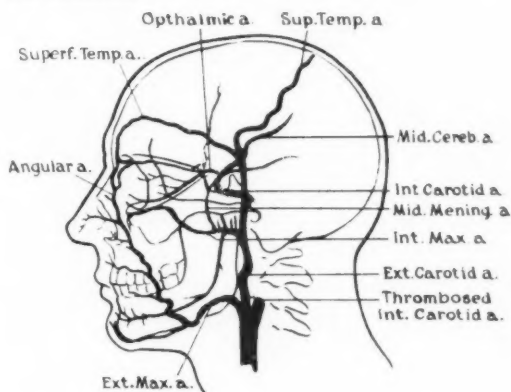


Figure 1

The internal carotid artery enters the skull through the carotid canal in the temporal bone, then runs anteriorly to form the carotid syphon. It gives off three branches, one of which is the ophthalmic artery, and then divides into the anterior and middle cerebral arteries. The ophthalmic branch accounts for the occasional finding of ipsi-lateral blindness and contralateral hemiplegia in patients with carotid artery thrombosis.

There is an excellent anastomosis between the branches of the external carotid artery and internal carotid artery as demonstrated on Figure<sup>1</sup>. These anastomoses may be summarized as follows:— (a) between the branches of the superficial temporal artery and the lacrimal and palpebral branches of the ophthalmic artery; (b) between the angular artery; that is, the terminal branch of the external maxillary artery and the inferior palpebral and dorsonasal branch of the ophthalmic artery; (c) between the orbital branches of the middle meningeal artery and lacrimal or other branches of the ophthalmic artery; (d) between the infra-orbital branch of the internal maxillary and the dorsonasal branch of the ophthalmic artery. Thus, there are four possible routes of blood flow besides the contralateral circulation through the anterior communicating artery. We feel that the degrees of patency of the anastomotic channels account for the difference in symptoms which these patients demonstrate clinically. Some are symptomless while others suffer complete hemiplegia.

\*Presented at Annual Meeting, The Canadian Association of Radiologists, January 11, 1955, Ottawa.

**Case Reports:**

1. The first case (Fig. 2) was a known hypertensive male, aged 50. He had had a slow onset of hemiplegia with loss of vision of his left eye. Eight months after the onset an angiogram was done. This showed an occlusion of the left internal carotid artery at the bifurcation. The patient subsequently died at another hospital. A remote infarct of the brain was found at necropsy but no occlusion of any of the cerebral vessels could be seen. Dissection of the neck was not carried out. However, no other cause for the remote cerebral infarct was found.



Figure 2

2. The second case was a white male, aged 46 (Fig. 3). This patient did not have hypertension. He had a sudden onset of right hemiparesis and right hemianaesthesia. His speech was good. The onset was on the 25th of February 1953. An angiogram was carried out on 11th April 1953. Occlusion of the left internal carotid artery just above the bifurcation was demonstrated. He partially improved with physiotherapy.



Figure 3

3. The third case was a white male, aged 52 (Fig. 4). He had a sudden onset of left hemiplegia on 8th December 1952. The patient had had some mental confusion, six months prior to the present episode. At that time he complained of tingling sensations in the left leg and thigh. The diagnosis was neuritis. He was not suspected of having any intracerebral or internal carotid thrombosis. On 10th February 1953 an angiogram showed partial obstruction of the right internal carotid artery. Some dye in the region of the carotid syphon could be seen and it is possible that this dye arrived via the anastomoses described previously. There was an anomalous occipital branch present.



Figure 4

4. The fourth case, a white male aged 46 (Fig. 5) complained of weak spells and headaches one week prior to his illness. On 23 April 1954 he experienced a sudden onset of collapse and complete right hemiplegia, aphasia and impaired vision of the left eye. The angiogram showed a block of the internal carotid artery opposite the first cervical vertebra and a distinct arteriosclerotic plaque could be seen in the internal carotid artery just above the bifurcation. This is well seen in Figure 5. The patient is now an invalid at home.



Figure 5



5. The fifth case, a white male aged 37 (Fig. 6) was admitted for thyrotoxicosis on 7 June 1954 and was to have been operated upon. While at home he developed Herpes Zoster on the left side of his neck. He placed hot and cold compresses on his neck to hasten the healing. This was just prior to the onset of slurring speech and right hemiplegia. The angiogram on the same day showed obstruction of the left internal carotid artery just beyond its origin from the common carotid artery. He has had only slight improvement since that time, otherwise his general condition is fair, but the patient is still an invalid.

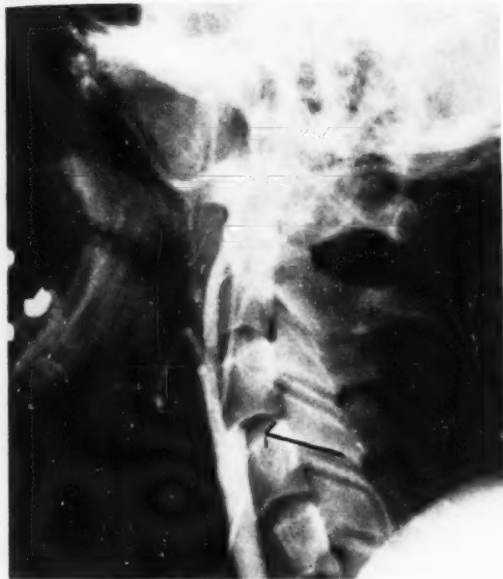


Figure 6

6. The sixth case, a male aged 47, complained of headaches for two weeks prior to the acute episode. On 27 April 1954 he had a sudden onset of left hemiparesis. The angiogram on 4 May 1954 showed thrombosis of the left internal carotid artery 1 cm. above the bifurcation. The patient is still an invalid.

7. The seventh case, a male aged 47 was admitted on 19 November 1954. He developed a sudden onset of hemiplegia on the right side and some left-sided frontal headaches. The angiogram on 25 November 1954 demonstrated an occlusion of the right internal carotid artery in its proximal 2 to 3 cms. Figure 7 shows a good collateral circulation from the external carotid. There is good filling of the middle cerebral vessels in spite of the occlusion of the internal carotid artery (not shown). The patient is still aphasic at the present time.



Figure 7

8. The eighth case, a male aged 53, was a hypertensive with blood pressure of 186/90. Following a car accident there was a rapid onset of left hemiplegia and headache. Ptosis of the right eye was present. The angiogram showed complete obstruction of the right internal carotid artery.

9. The ninth case, a male aged 63, had had a left hemiplegia for the past 7 or 8 years. The onset of slurring speech occurred 9 days prior to the present admission. The angiogram showed obstruction of right internal carotid artery.

10. In addition to these nine cases which were demonstrated by angiography, there were 3 cases found at post mortem. These were found because either recent or remote infarcts of the brain were present at necropsy without evidence of intracerebral arterial disease. The neck was then explored. The first of these, a 74-year old male, had a sudden onset of hemiplegia following a fight with another patient. The other patient attempted to strangle him. An obstruction of both internal carotid arteries was seen at post mortem.

11. The second of these cases was a 58-year old male who had had a cerebro-vascular accident five years previously. At that time he fell while lifting a pail of water and struck the right side of his neck on a pipe. At post mortem an old occlusion of the right internal carotid was demonstrated and a definite infarct of the brain.

12. The third was a 70-year old male who had a shuffling gait with mild signs of left hemiparesis. At post mortem this patient showed obstruction of the left internal carotid artery and left vertebral artery. We are unable to account for the left-sided symptoms in this patient.

#### Discussion:

Of the nine cases demonstrated by angiography it is of interest to note that eight of these were between the ages of 37 and 53. One of the nine was 63 years of age; however, the original onset of his disease was 8 years previous at the age of 55. Thus, most of our cases are in a relatively young age group. We feel that this is probably due to the fact that we are dealing with a selected group of cases. The three patients from our autopsy series were between 68 to 74. This would be in keeping with the post mortem findings of Fisher<sup>2</sup>. He, too, found that the age group at routine necropsy was higher.

Definite localizing signs were seen in few patients to suggest that the lesion was in the internal carotid artery. The diagnosis was suspected in one patient, four of the cases were labelled as cerebrovascular accidents, two as cerebral thrombosis, one as a possible metastasis and one as a subdural hemorrhage.

Four of the nine cases had varying degrees of hypertension. In two of the cases we feel that a collateral circulation must have been present as some filling of the cerebral vessels occurred in spite of the presence of an occluded internal carotid artery.

Only two patients showed typical ipsilateral loss of vision. Pain over the forehead and eye on the side of the lesion, and ptosis of

the eyelid, were found in three cases. Three patients showed characteristics prodromal symptoms, weeks to months prior to clinical onset.

Direct physical trauma to the side on which thrombosis occurred was apparently a predisposing factor in two of the cases diagnosed by angiography and in two of the cases diagnosed by post mortem.

The etiology of this condition is apparently due to atherosclerosis according to Dow<sup>4</sup>. He has shown that atherosclerosis occurs most frequently at the bifurcation of the common carotid artery and in the region of the carotid syphon. This corresponds well to the sites of thrombosis found by angiography. Cerebral thrombo-angiitis obliterans has been described as a possible etiological factor.

Several authors have suggested that the cause of prodromal symptoms could be due to partial occlusion of the internal carotid by thrombus and subsequent small emboli to the brain. Others have felt that the thrombosis in the internal carotid artery produces reflex spasm of the cerebral vessels and, hence, symptoms.

In the literature, there are 29 cases recorded in which an angiogram on the opposite side was performed. These often showed good filling of the anterior cerebral artery on the diseased side. However, of the four deaths reported following angiography, in cases of internal carotid thrombosis, all occurred when the normal side was done. It is, therefore, felt that the procedure of studying the normal side with angiograms is dangerous and should not be done.

### Summary:

Twelve cases of thrombosis of internal carotid artery have been presented. These have been discussed and some opinions from recent literature have been brought forward. It is hoped, that further interest in this subject may be stimulated by this presentation.

### Acknowledgments:

*The authors wish to thank Dr. Paul New, Victoria Hospital, London, Ontario, for the use of cases 6, 7, 8, and 9. They are indebted to Mr. Don Pulham (District Photographer) Department of Veterans Affairs, London, Ontario, for the excellent illustrations.*

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## ROENTGEN FINDINGS IN GENITAL TUBERCULOSIS IN WOMEN

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Montreal, Quebec

Tuberculosis of the genital tract, in women, is rather uncommon; but since it always happens during the reproductive period, it becomes an important gynecologic problem because of a severe complication: sterility.

This affection was particularly investigated by Swedish and Chinese gynecologists and radiologists. According to these authors, sterility is usually the only symptom. Women do not complain about any other subjective trouble and genital examination is negative most of the time<sup>2</sup>. Quite often too, there has been no previous known tuberculous infection. The disease progresses slowly and silently, making clinical diagnosis uneasy. However, hystero-gramy supplies quite valuable data and some radiological findings are almost pathognomonic of tuberculosis.

### Pathogenesis

Genital tuberculosis is not an isolated affection but is always secondary. Dissemination is made through the blood stream from some distant focus, most of the time, a pulmonary lesion. The tubes are always the first involved, generally in the ampulla; then, the pathological process may extend to the endometrium<sup>1</sup>. Histological lesions are exactly the same as they are in other viscera.

"Tubercle, epithelioid cells and giant cells in the mucosa and other layers form a characteristic picture". (Boyd.) Fibrosis and calcifications imply a healing process.

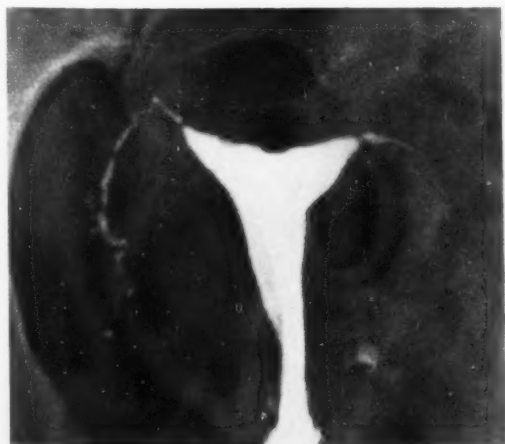


Figure I. — (Case 1) Left tube resected. The right one has multiple strictures and intramural recesses.



Figure II. — (Case 1) Stagnation of the contrast medium in pseudo-diverticula.



Figure III. — (Case 2) Ampulla of the left tube is dilated with many fistula-like formations. The right one is not so much affected. Uterus seems normal.

### Roentgen Picture

Deep ulcerations and connective tissue induration cause morphological changes in the uterus and the tubes. This may be demonstrated by roentgen examination.

Since the tubes are always primarily involved<sup>1</sup>, one should look there first for pathological changes. Both of them are affected but usually not to the same degree. Their contour is irregular and ragged. They are dilated and club-like. Because of the oedema, the

mucous membrane shows hypertrophic and irregular relief. If a caseous formation is expelled, the roentgen picture is quite the same as that of a pyosalpinx of different etiology.

When Koch bacillus is the causative agent, the following typical features are found:

1. Straight and rigid tubes with a "pipe-like" configuration<sup>3,4</sup>;
2. Multiple strictures of the tubal lumen,<sup>1,2</sup>;
3. Fistula-like formations and intramural recesses,<sup>1,2,3,4</sup>.

Fixity and strictures imply a healing process characteristic of T.B. infection. They show the connective tissue scar and induration in the wall of the tubes. On the other hand, the pseudo-diverticula are produced by infiltration of the opaque fluid in an ulceration deeper than the mucosa, indicating an active lesion<sup>2,4</sup>.

The same strictures and recesses are found in the uterus which may become hypoplastic and even take a bicornuate shape<sup>2,4</sup>.

A complete roentgenological examination should begin with<sup>1-4</sup>:

1. A plain film of the pelvis to visualize any calcification and compare its relation to the opacified genital tract.
2. The contrast medium must be injected under fluoroscopic control, in small amounts, to study the mucosa. Frontal as well as oblique exposures are made.
3. Finally, another film of the pelvis is taken several hours after the examination to appraise the tubal permeability.



Figure IV. — (Case 3) Large uterine cavity with irregular contour. Tubal rigidity and dilated ampulla with hypertrophic ridges. (Water-soluble contrast).



Figure V. — (Case 4) Considerable injection of the venous plexuses of the uterine wall. Strictures and ulceration of the fundus. Rigidity and impermeability of both tubes.



Figure VI. — (Case 5) Tight stricture of the left cornua. Distortion of the fundus. Recesses in the fundus, the left cornua and the right tube. (The left side is seen at the left of the picture).

When sterility is the main complaint, the use of an oily suspension is recommended because it stays longer in the pathological tubes or in the free abdominal cavity. On the other hand, an aqueous suspension is used when a mucosal lesion is suspected. It is less opaque and it has greater fluidity.

#### Own Investigations

The Chinese and Swedish authors found tuberculosis responsible for about 10% of all cases of sterility. This represents about 2% of all patients submitted to hystero-graphy<sup>2,4</sup>.



In order to compare our statistics with those of other hospitals, we made a survey of the roentgenological examinations made in Notre-Dame Hospital from January 1951 to April 1955. 1083 examinations were done. 33% of the patients had consulted for sterility, 31% for dysmenorrhea, 26% for metrorrhagia and 10% for enlargement of the abdomen. 553 of these patients were submitted to surgery followed by microscopic examination of the uterus and or adnexa. In five cases only, the pathological report was positive for tuberculosis, that is to say less than 1%.

These results being much lower than those found elsewhere might be explained either by a smaller frequency of that infection in our province or by a misinterpretation of the roentgen pictures. A review therefore was made of all the examinations and 16 other cases were discovered which presented the peculiar signs mentioned above. (Figs. 6-11.) A proportion of 21 out of 1083 cases comes closer to the percentage found elsewhere.

There were no accidents during or after the hystero-graphy; most of them were carried out with an oily contrast medium.

### Case Reports

(All cases mentioned here were pathologically confirmed.)

#### Case 1

A nurse of 23 was hospitalized for acute pains in the left iliac fossa, relieved by D  m  rol only. For five days, her temperature remained constant at 102  F.

No menstrual trouble since puberty. She reported having had pleurisy of unknown etiology during her childhood but recalled no tuberculous contact.



Figure VII. — (Unproved case) Bilateral hydrosalpinx. Tubal fixity with fistula-like formations on both sides.



Figure VIII. — (Unproved case) Id. fig. 7.



Figure IX. — (Unproved case) Uterine hypoplasia with isthmic stricture. Left tube inadequately opacified. Numerous recesses of the right one.

Genital examination disclosed a small, irregular, adhesive mass in the left cul-de-sac and movements of the cervix elicited severe pain. Chest roentgenogram negative.

Pre-operative diagnosis: Rupture of Graafian follicle with pelvic hematoma. Laparotomy disclosed a left necrotic tube adherent to the sigmoid, and numerous tubercles disseminated on the peritoneum and the tubes. Resection of the left tube was performed. Microscopic diagnosis: Subacute interstitial salpingitis with tuberculous granuloma. Tuberculous peritonitis.

Hystero-graphy was done 3 years later. (Fig. 1.) The left Fallopian tube was missing; the right one, stiff and irregular. The oily contrast spread in its wall in fistula-like formations clearly visible 24 hours after the injection. (Fig. 2.) The uterine fundus showed two regular notches possibly due to healing endometritis. (Since this examination, the patient underwent a nephrectomy for renal tuberculosis.)

# Case 2

Woman of 29 was complaining of pains in the iliac fossae for 8 months. Since then, her menses had been scanty, shorter and there was rather profuse yellowish leukorrhea without prurit. Married for 7 years, she had never been pregnant. Following an endometrial biopsy, 6 months earlier, in another hospital, she was advised to have a salpingectomy, which she refused. (Histological report not available.)

On admission to the hospital, the patient had no fever, and chest X-ray was negative. Internal examination revealed tender mass in both culs-de-sac and the patient was operated on for bilateral salpingitis.

Exploration showed a pelvic cavity filled with adhesions. The tube and the caecum on one side and the sigmoid on the other were coalesced together. Hystero-salpingectomy was performed.

Pathological report: Subacute inflammatory reaction of endometrium. Right tube contains creamy pus (caseum) and wall of both adnexa are filled with follicles. Ziehl staining is negative.

Repeated roentgenological examinations showed ragged and fixed tubes with club-like shape. There were intramural recesses on the left side and no visible changes in the uterine cavity. (Fig. 3.)

# Case 3

Woman of 34 sought medical advice because of dysmenorrhea on the fourth day of menses and menorrhagia for 6 months. No previous pregnancy in 7 years of marriage. Nephrectomy at 21 for renal tuberculosis.

Chest roentgenogram outlined a likely healed Pott's disease and a calcification in the left lower lobe. Vaginal examination revealed a sore mass in the left cul-de-sac.

At laparotomy, 200 c.c. of yellowish fluid was found and all abdominal structures were scattered with small white nodules. Both tubes were dilated and adherent to the ovaries, and they both contained a creamy pus. Bilateral salpingectomy was performed. Microscopical examination demonstrated tuberculous lesions in the tubes and on the peritoneum. Culture and guinea pig inoculations were positive.



Figure X. — (Unproved case) Both tubes present intramural diverticula but they are unevenly affected.



Figure XI. — (Unproved case) Uterus bicornis possibly due to a healing process. Tubal rigidity with unequal fistula-like formations on each side.



Figure XII. — Calcifications in both tubes suggesting diagnosis of Tuberculosis.

A water-soluble medium was used for this examination. (Fig. 4.) As in the former cases, the tubes retained the same rigid position. There was no visible recesses but the ampullae were distended and showed very pronounced hypertrophic ridges due to enlarged villae formations. Uterine cavity was wide and irregular.

# Case 4

Patient complained of a dull pain in the left quadrant irradiating in the lower extremities and dyschizia. Menses were scanty. Abdomen has been progressively enlarging for 8 months but she was not pregnant and has never been in 8 years of married life. She was operated on 10 years before for tuberculous peritonitis.

Physical and roentgenological examinations of the lungs were negative. On vaginal examination, a small painful mass was palpable.

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At laparotomy, all structures in the left hemipelvis were found to be matted and bound together. The ovary was enlarged and had a caseous appearance. Uterus and both adnexa were removed. Histological study demonstrated diffuse tuberculous changes in the tubes and the endometrium. Ziehl staining of the ovary was positive.

The roentgen picture of the genital tract is, in this case, muddled by a network of opacified vessels. This injection of venous plexuses is already an indication of endometrial lesion. Furthermore, the uterus is very small and presents two strictures and a recess of the right cornua. The tubes are fixed, impermeable, with fistula-like excavations. (Fig. 5.) Such findings, especially with a history of tuberculosis, strongly support a diagnosis of tuberculous endometritis and salpingitis.

### Case 5

A woman in her thirties was hospitalized for an acute abdominal syndrome. For a week she had experienced severe pains in both iliac fossae radiating to the thighs, with fever, anorexia, nausea, etc.

She has had dysmenorrhea since puberty but there have been no modification in her menstrual cycle. She has been married for 2 years without any pregnancy. She had her appendix removed 3 years ago. No personal or familial history of tuberculosis.

Physical examination revealed general lymphadenopathy and a small tender mass in the left cul-de-sac. Chest X-ray showed a likely cicatricial lesion in left apical segment and pleuro-pericardial adhesions.

Preoperative diagnosis: Left pyosalpinx. At laparotomy, an enlarged tube and ovary filled with necrotic substance (caseum) were removed. The pathologist reported a diffuse infiltration by giant cells, lymphocytes and so-called epithelioid cells.

After having undergone sanatorium treatment for a month, the patient had a relapse of acute abdominal pains, and this time, the uterus and right adnexa were removed.

Hystero-gram showed a tight stricture of the left cornua, irregular contour of the fundus uteri with intramural recesses. The tubes were rigid and closed in the ampulla. (Fig. 6.)

### Discussion

In cases one, two and five, there is no previously known tuberculosis. The first and the fifth ones were hospitalized because of an acute abdominal syndrome. Therefore, genital

tuberculosis is not always asymptomatic. In the latter cases, differential diagnosis from salpingitis of any other etiology was not clinically possible but both had a roentgenogram typical of tuberculosis.

None of the patients sought medical advice because of sterility although the married ones had no children. Among the 16 unproved cases, sterility was the only complaint in 8 of them. It has been demonstrated that there are usually few or no symptoms in genital tuberculosis, but this possibility cannot be ruled out in cases of acute salpingitis.

Differential diagnosis must be made from adenomyosis. In the latter, the tubes are not necessarily affected before the uterus. There can be intra-mural recesses if aberrant endometrial tissue communicates with uterine lumen, which is rather uncommon.

Calcifications in the tubes have never been found in any other disease. (Fig. 12.) Calcium deposits in the uterine or ovarian sites, on the other hand, may represent a calcified fibroma, a retained placenta, a teratoma, etc.

On the whole, diagnosis of genital tuberculosis in women is not always roentgenologically possible, but when the hystero-gram discloses tubal rigidity, strictures and intramural recesses with or without similar findings in the uterus, the diagnosis may be made with a high degree of probability.

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